CLAIMS

1. A system for producing energy, comprising

a solvent chamber for holding a solvent solution,

a pressure chamber for holding a solute solution, and

a semi-permeable barrier separating the solvent chamber from the pressure chamber, wherein the barrier is permeable to solvent molecules and impermeable to solute molecules,

wherein solvent molecules effuse across the semi-permeable barrier into the solute solution of the closed pressure chamber to increase the pressure of the pressure chamber, thereby generating energy in the form of hydrostatic pressure.

2. The system of claim 1, wherein the solute solution is a saturated solution.

3. The system of claim 1, wherein the semi-permeable barrier is a membrane.

4. The system of claim 1, wherein the semi-permeable barrier is a gel.

5. The system of claim 3, further comprising a cartridge containing the membrane, wherein the cartridge is open to and contiguous with the solvent chamber.

6. The system of claim 5, wherein the cartridge is a reverse osmosis cartridge.

7. The system of claim 1, wherein the concentration of the solute solution is maintained at a substantially constant level.

8. The system of claim 1, wherein the pressure chamber includes crystals of undissolved solute to maintain said solute solution as a saturated solute solution.

9. The system of claim 1, wherein the solvent chamber is open.

10. The system of claim 1, wherein the solvent chamber is closed.

11. The system of claim 1, further comprising one or more valves for opening and closing the solvent chamber.

12. The system of claim 1, further comprising a conversion device for converting hydrostatic pressure in the pressure chamber to mechanical work.

13. The system of claim 12, wherein the conversion device includes a first piston in communication with the pressure chamber, wherein the piston moves from a first position to a second position in response to an increase in pressure in the pressure chamber due to the diffusion of solvent molecules into the pressure chamber.

14. The system of claim 13, wherein the conversion device further comprises a diaphragm that separates the pressure chamber from hydraulic fluid in communication with the first piston.

15. The system of claim 14, wherein the conversion device further comprises a push rod connected to the first piston, wherein the push rod moves in response to movement of the first piston.

16. The system of claim 15, further comprising a mechanical device connected to the push rod, wherein the movement of the push rod is used to operate the mechanical device.

17. The system of claim 16, wherein the mechanical device comprises one of an alternator, a generator, a gear, a fly wheel, a hydraulic motor and a lever.

18. The system of claim 13, further comprising a return system for moving the piston back to the first position.

19. The system of claim 18, wherein the return system comprises a return spring for pushing the push rod.

20. The system of claim 18, wherein the return system comprises a second system comprising a second solvent chamber, a second pressure chamber, a second semi-permeable barrier separating the second pressure chamber from the second solvent chamber and second piston that moves in response to solvent flow from the second solvent chamber through the semi-permeable barrier into the second pressure chamber, wherein the second piston pushes the first piston back to the first position.

21. The system of claim 18, further comprising an exhaust system for exhausting solute solution as blow-down when the first piston moves back to the first position.

22. The system of claim 18, further comprising a recycling system for recycling solvent after the piston moves back to the first position.

23. The system of claim 22, wherein the recycling system uses a portion of the energy produced by the system for producing energy.

24. The system of claim 23, wherein the recycling system comprises a blow-down receiving chamber for collecting solute solution expelled through an exhaust channel during backward travel of piston to the first position.

25. The system of claim 24, wherein the recycling device further comprises a heating device connected to the blow-down receiving chamber for vaporizing the solvent in the solute solution into solvent vapor, while retaining solute residue in solid form.

26. The system of claim 25, wherein the heating device uses heat from a radiant heat source.

27. The system of claim 26, wherein the heating device uses heat from an electrical heating device.

28. The system of claim 25, wherein the recycling device further comprises a condenser for receiving the solvent vapor from the blow-down receiving chamber, converting solvent vapor to liquid solvent and returning the liquid solvent to the solvent chamber.

29. The system of claim 28, wherein the recycling device further comprises a vacuum pump for applying a vacuum in the solvent chamber to lower vapor pressure of solvent in combination with the heating device to facilitate vaporization of the solvent.

30. The system of claim 25, wherein the recycling system further includes a solute recycling device for returning the solute residue to the pressure chamber after vaporization of the solvent.

31. The system of claim 24, wherein the blow-down receiving chamber freezes the solute solution to freeze-dry or concentrate the solute.

32. The system of claim 1, further comprising a buffer chamber in communication with the pressure chamber for setting a pressure in the pressure chamber to a desired pressure.

33. The system of claim 32, wherein the buffer chamber is filled with compressed gas and includes an elastic diaphragm that separates the solute solution in the pressure chamber and the compressed gas in the buffer chamber.

34. The system of claim 1, further comprising a control valve for permitting solvent flow from the solvent chamber, across the membrane and into the pressure chamber.

35. The system of claim 1, further comprising a flow restricting device for controlling solvent flow from the solvent chamber through the membrane.

36. The system of claim 1, wherein the solvent comprises a water solution, methanol, liquid bromine and mixtures thereof.

37. The system of claim of claim 1, wherein the solute comprises NaCl, $AlCl_3$, LiCl, solvent-soluble acids, bases, metal salts of inorganic acids, metal salts of organic acids; chlorides, sulfates, nitrates, sugars, colloidal osmotic agents, inorganic or organic polymers, sugars, alcohols and mixtures thereof.

38. The system of claim 5, wherein the cartridge is located in the interior of the pressure chamber.

39. The system of claim 5, wherein the cartridge comprises two layers of membrane separated by separator to form a sack.

40. The system of claim 13, further comprising a plurality of pistons.

41. The system of claim 5, further comprising a plurality of membrane cartridges.

42. A method of producing energy, comprising:

providing a system for generating energy comprising a solvent chamber, a pressure chamber and a semi-permeable barrier separating the solvent chamber from the pressure chamber;

filling the solvent chamber with a solvent;

filling the pressure chamber with a solute solution comprising a solute and solvent;

flowing solvent from the solvent chamber to the membrane, such that solvent molecules effuse across the semi-permeable membrane into the solute solution, thereby increasing the pressure in the pressure chamber; and

converting the increased pressure in the pressure chamber to energy.

43. The method of claim 42, further comprising the step of exhausting solute solution from the pressure chamber.

44. The method of claim 43, further comprising the step of recycling solute solution after exhausting the solute solution from the pressure chamber.

45. The method of claim 44, wherein the step of recycling comprising separating solute molecules from solvent molecules in the solute solution.

46. The method of claim 45, wherein the step of separating the solute molecules from solvent molecules comprises vaporizing the solvent.

47. The method of claim 46, further comprising the step of condensing the vaporized solvent to liquid solvent.

48. The method of claim 47, further comprising the step of returning the liquid solvent to the solvent chamber.

49. The method of claim 45, further comprising the step of returning the solute molecules to the pressure chamber.

50. A method for producing and maintaining a steady-state, high pressure, comprising the steps of:

providing a system for generating energy comprising a solvent chamber, a pressure chamber and a semi-permeable barrier separating the solvent chamber from the pressure chamber;

filling the solvent chamber with a solvent;

filling the pressure chamber with a solute solution; and

flowing solvent from the solvent chamber to the membrane, such that solvent molecules effuse across the semi-permeable membrane into the solute solution, thereby increasing the pressure in the pressure chamber.

51. The method of claim 50, further comprising the step of pressurizing the solvent chamber.

52. The method of claim 51, wherein the step of pressurizing the solvent chamber comprises using an external pressure pump in communication with the solvent chamber.

53. The method of claim 50, further comprising the step of converting the pressure increase in the pressure chamber to energy.

54. The method of claim 53, further comprising the step of pressurizing the solvent chamber.

55. The method of claim 54, wherein the step of pressurizing the solvent chamber comprises using an external pressure pump in communication with the solvent chamber.

56. The method of claim 55, further comprising the step of powering the external pressure pump using a portion of the energy generating by converting the pressure increase in the pressure chamber.

57. A method for producing a vacuum, comprising the steps of:

providing a device comprising a closed solvent chamber, an open pressure chamber and a semi-permeable barrier separating the solvent chamber from the pressure chamber;

filling the solvent chamber with a solvent;

filling the pressure chamber with a solute solution;

flowing solvent from the solvent chamber to the membrane, such that solvent molecules effuse across the semi-permeable membrane into the solute solution, thereby leaving a void in the solvent chamber.

58. The method of claim 57, further comprising the step of exhausting the solute solution from the pressure chamber.

59. The method of claim 57, further comprising the step of controlling the flow of solvent from the solvent chamber.

60. A membrane cartridge for separating a pressure chamber from a solvent chamber in a system for producing energy, comprising:

a first layer comprising a material through which solvent molecules can pass, while preventing passage of solute molecules,

a second layer comprising a material through which solvent molecules can pass, while preventing passage of solute molecules, wherein the second layer is connected to the first layer to form a sack having a pocket;

a support disposed within the pocket of the sack.

61. The membrane cartridge of claim 60, wherein the first layer and second layer are joined, such that the sack is closed on three sides and open on a fourth side.

62. The membrane cartridge of claim 61, further comprising a perforated tube attached to the fourth side of the sack.

63. The membrane cartridge of claim 62, further comprising one or more o-rings for sealing the perforated tube to the solvent chamber.

64. The membrane cartridge of claim 63, wherein the cartridge is configured to be placed in the interior of the pressure chamber and in communication with the solvent chamber.

65. The membrane cartridge of claim 62, further comprising a second perforated tube connected to another side of the sack.